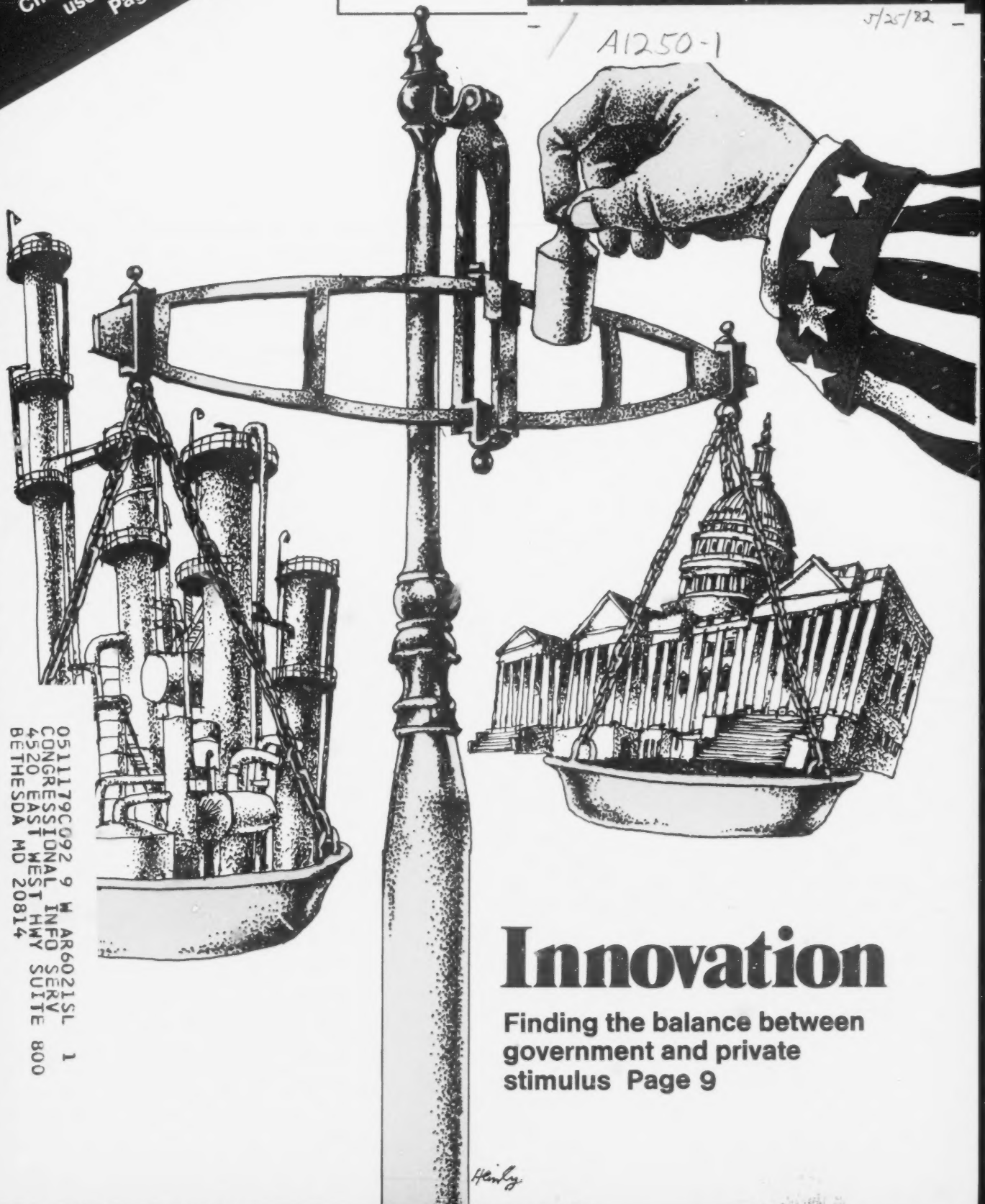
Chemical & Engineering NEWS

Chemical plant capacity use hits new low Page 16

5/25/82
A1250-1



Innovation

Finding the balance between government and private stimulus Page 9

05111179C092 9 W AR6021SL 1
CONGRESSIONAL INFO SERV
4520 EAST WEST HWY SUITE 800
BETHESDA MD 20814

May 24, 1982
Volume 60, Number 21
CENEAR 60 (21) 1–60
ISSN 0009-2347

Chemical & Engineering NEWS

4 Letters

The Departments
60 Newscripts

Concentrates
15 Business
24 Government
33 Science/Technology

News of the Week

- ***Kuwaiti interests*** *have purchased 25% of Hoechst, rumors go.* ***Page 6***
- ***Professional societies held liable*** *for standards set by members.* ***Page 7***
- ***Chemical industry will boost*** *pollution-control spending 10% in 1982.* ***Page 7***
- ***Neighbors of Three Mile Island vote no*** *to restarting nuclear reactor.* ***Page 8***
- ***U.S. output of aerosols*** *rose 1.5% in 1981 over 1980 production.* ***Page 8***
- ***Dow Chemical petitions EPA*** *for exemption for monochlorinated biphenyls.* ***Page 8***

News Focus

- ***Innovation in U.S.*** *may be spurred by better balance between private and government involvement.* ***Page 9***

Business

- ***U.S. chemical capacity use*** *goes down to 60%.* ***Page 16***
- ***Pickup in polypropylene business*** *is only bright spot for olefins makers.* ***Page 19***
- ***Weaker sulfur markets*** *predicted for next two years.* ***Page 20***

International

- ***U.S. chemical exports*** *face stiff competition from foreign world-scale plants.* ***Page 21***
- ***Chemical needs of South American*** *markets are changing constantly.* ***Page 22***

Government

- ***House Agriculture Committee*** *approves changes in pesticide regulation.* ***Page 25***

Science

- ***Stability of six-nitrogen ring debated;*** *scientists study possibility of synthesis at low temperature.* ***Page 36***

Gibbs Medal

- ***Gilbert Stork*** *of Columbia University receives Willard Gibbs Medal.* ***Page 37***

Education

- ***NAS conference on precollege education*** *in science and math spots problems, disagrees on federal participation.* ***Page 39***

Books

- ***Life in space?*** *Author and reviewer think so, but differ as to what kind.* ***Page 42***

ACS News

- ***Latest CPR report on layoffs*** *proves older chemists are not immune.* ***Page 44***
- ***Official reports*** *of Las Vegas meeting include committee doings.* ***Page 45***

Voters reject reopening undamaged TMI plant

True it was a nonbinding referendum, but it was overwhelming. By a vote of more than two to one, Pennsylvania voters living in three counties near the Three Mile Island nuclear plant voted against restarting the undamaged reactor adjacent to the one involved in the March 1979 accident.

The vote can't legally affect the Nuclear Regulatory Commission's decision on licensing the undamaged unit that has been shut down for three years because of problems in the steam-generator tubing. Still, its decisive nature can't be ignored, says commission chairman Nunzio J. Palladino. An NRC representative echoes that, saying the vote will be "taken into account to the extent that it can be" within the confines of the commission's mandate.

That sentiment apparently can be ignored by GPU Nuclear, which operates the Three Mile Island plant. President Robert C. Arnold says he is "reluctant to draw firm conclusions" from the vote.

The referendum vote comes on the heels of a federal appellate court decision that requires NRC to consider the pyschological distress a startup of the plant might cause nearby residents. In an unprecedented two-to-one decision that the dissenting judge characterized as "a court-imposed paralysis of nuclear power," the court ordered NRC to tally the "anxiety, tension, and fear" resulting from startup as well as quantifying the possible physical damage to people and the environment.

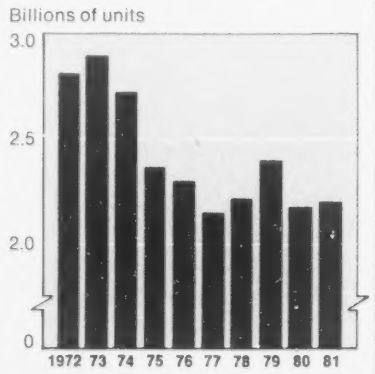
This reckoning would occur in the court-ordered environmental impact statement NRC must complete before licensing a startup of the undamaged reactor. A spokesperson for the commission says staff members are now reviewing the court order, and a decision on whether to appeal the recent court opinion or to complete the required impact statement has not yet been made.

If the decision stands, the language of the ruling is so broad that it could delay startup of the Three Mile Island plant and also affect other nuclear reactor projects and even any large project with federal involvement. □

Output of aerosols up a little in 1981

U.S. aerosol production rose 1.5% in 1981 from the 1980 level, according to the latest annual "pressurized products survey" made by the Chemical Specialties Manufacturers Association. At CSMA's midyear meeting in Chicago, survey committee chairman Jay C. Cronin, Sherwin-Williams' national sales manager for aerosol containers, disclosed that an estimated 2.20 billion container "units" were filled in 1981, compared to about 2.16 billion units in 1980.

Aerosol production showed slight upturn in 1981



Source: Chemical Specialties Manufacturers Association

Aerosol production reached a peak of 2.90 billion units in 1973. That year marked the start of the fluorocarbon-ozone controversy. Over the following four years, production declined 26% to a 1977 low of 2.15 billion units. The controversy continues; however, the aerosol industry phased out fluorocarbon propellants and embarked on a pro-aerosol publicity campaign. Production rose again, to 2.23 billion units in 1978 and 2.40 billion units in 1979.

In 1980, aerosol production again dropped sharply (9.8%), to 2.16 billion units, only a little above the 1977 low. That decline was blamed more on the general state of the economy than on lingering effects of the ozone issue. Last year the economy was even worse off, so producers could "pat themselves on the back" for achieving even a small increase, Cronin says.

Personal products continued to be the largest product category in 1981, representing about 30% of the total (compared to more than 50% in 1972). An estimated 644.6 million units were filled, about 1.1% more than in 1980. Household products, the second category, accounted for 575.0 million units, a 0.9% decrease from 1980. Among other categories, pressurized insecticides totaled 173.0 million units, 15.7% higher than in 1980. □

Dow asks EPA ruling on chlorinated biphenyls

Dow Chemical Co. has filed a citizen petition with the Environmental Protection Agency to exempt monochlorinated biphenyls from regulations that control polychlorinated biphenyls.

The petition asks that EPA Administrator Anne M. Gorsuch issue a separate rule specific for MCBs because they are different from PCBs. EPA has maintained that, regardless of the scientific arguments, PCBs include MCBs for regulatory purposes.

Dow states in its petition that there is much new evidence demonstrating that MCBs are not dangerous to the environment or to public health. This includes data showing that MCBs are not found in the environment, they do not accumulate in biological tissues, and they have minimal toxic effect potential.

Dow and EPA have been fighting over this issue for almost three years. Dow lost a court case brought by EPA, and could be fined for once selling an insulating fluid containing high levels of MCBs without proper labeling.

The problem started when EPA, as mandated specifically by Congress, was issuing regulations for controlling PCBs. These compounds were defined as "the biphenyl molecule that has been chlorinated to varying degrees." Because the legal definition does not say two or more chlorine atoms, EPA's attorneys insist the agency has to regulate monochlorinated compounds, too. Dow, and some members of Congress, denies that this is what the law intended.

Dow contends that EPA's stance has cost the company more than $13 million so far, but the company will continue to make products containing MCBs because some of them have unique properties. MCBs are found, usually in minute amounts, in some chemical intermediates, heat exchange fluids, and dielectric fluids, the company says. A response on whether EPA will hear the petition is expected in about 90 days. □

Balance in innovation involvement being sought

Reagan theme of reducing federal role forces states, universities, and industry to seek new forms of cooperation, but business schools seem to be lagging in improving management of productivity

Wil Lepkowski
C&EN, Washington

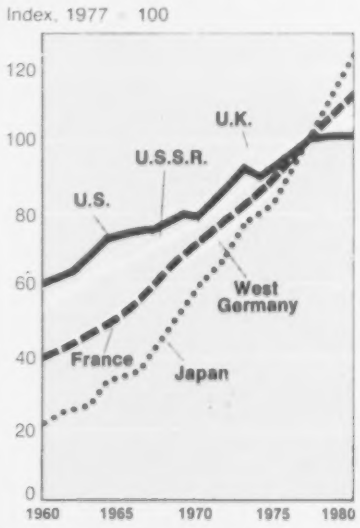
A top to bottom rethinking about America's still-dominant research and development might is emerging. Not only is there a rethinking, but finally, a redoing. In region after region of the country, industrialists and engineering school academics are getting together to search for new ways to collaborate in moving ideas from the concept stage through product development and into markets. But more fundamental to that is the quest to figure out the proper dynamic balance between government and private sector involvement. There is an honest to goodness search now for a viable U.S. technology policy that will carry the country into a new era of global leadership.

No bets are being taken as yet. For America still is wrestling with what it means to be, like industrially sorrowful England, an "overdeveloped" country. What appears to be emerging is a potentially new form of federalism combining the workings of local and state governments with the kinds of industrial initiatives that were so common during the early stages of America's second industrial revolution.

The proper distribution of private and public "technology policies," or stimuli, is being sought all across the country—from Minnesota, where new coalitions are being formed in biotechnology and microelectronics between the state university and various corporations, to North Carolina where the state legislature is investing millions of dollars in research parks where academic research can be moved into industrial application, to Massachusetts where a high-technology council struggles with attempts to find the right mix of state-corporate investments in the development of new industries.

A new beginning is needed, and needed badly, because the national economy continues to look bad. Business bankruptcies, according to Dun & Bradstreet, are at their highest official level in 40 years. Congress and the President are engaged in a knock-down, drag-out fight over the huge $100 billion-plus budget deficit projected for 1983. Interest rates show no signs of falling, though inflation apparently continues to decline. Unemployment is at record levels not only here but in Europe. The productivity figures are miserable in terms of rate of growth. Michigan's economy, so tied to auto manufacture, is practically a basket case. Universities can't find enough qualified engineering professors to meet student needs. Secondary school science education is under the gun. Housing construction is motionless. Steel's decline is leaving the shabby, sooty communities in the Ohio and Monongahela valleys even more squalid. American banks only barely conceal their worries over the default of their loans given to eastern European countries and Argentina. Black youths seethe over the lack of jobs. The chemical industry, already feeling the pain of recession, is beginning to feel breathing down its neck the competition from products made in the newly industrializing countries. And the balance of American trade grows worse.

U.S. productivity growth has lagged since 1976



Note: Productivity defined as output per worker hour in manufacturing industries. Data for 1980 are estimated. **Source:** "Science Indicators—1980," National Science Foundation

So far, the Reagan Administration has adopted no technology policy described by that name. White House sources say that the President could in a few months deliver a White Paper on the subject, but so far there is only silence on the subject, or even a contradiction of thoughts.

For example, whereas White House science adviser George A. Keyworth says that American management is doing a pretty good job advancing U.S. technology, Commerce Secretary Malcolm Baldrige insists that the failure of American productivity has its roots in poor American management. The national consensus seems to be that Baldrige is right and that Keyworth, whose background is physics done at a national weapons laboratory, has a few things to learn.

So does the country, although the proper word might well be "relearn," for the effort seems to involve recapturing a lost magic. U.S. business schools in particular are in need of a shaking up.

At Dartmouth College, Hanover, N.H., for example, two prominent schools of advanced pedagogy sit side by side. One is Thayer School of Engineering; the other is Tuck School of Business. One would think that in this era so shaken by troubling thoughts about America's decline in managing technological innovation, the two places would be buzzing with a joint search for solutions.

Nothing at Dartmouth, however, could be less likely. Tuck sails on by itself with its courses on management theory, leaving Thayer to ponder all by itself such issues as how to make the country more competitive with its more imaginative rivals, Japan and West Germany.

Says Thayer engineering design professor Frederick Hooven, "You can't teach Tuck anything. We have tried hard to initiate types of collaboration between the two schools but with little response. They are highly academic there, while engineering is not seen as a respectable academic subject."

This aversion to bridge-building isn't confined to Dartmouth. It pervades just about all of the country's university campuses, making it a curious, if not a tragic, cultural phenomenon. Study after study shows that the failure of U.S. technology to compete effectively with its foreign competition is a failure of management. Yet the business schools strangely have sat aloof from any responsibility to set things right. Studies of technological innovation primarily have been the domain of the technological and scientific communities with their own self-limiting perspectives and response mechanisms.

Nor can the engineering schools escape their share of fault. At Massachusetts Institute of Technology, for example, a decision was made after World War II to stress not hands-on manufacturing ideas and processes to students but more theoretical academic approaches. The result was the breeding of engineers who knew nothing about problems on the factory floor, or productivity, or working with shop foremen. Since most other engineering schools in the country followed the MIT model, U.S. manufacturing technology began to decline. Meanwhile, West Germany and Japan, with their economic survival at stake, began revving up their managerial engines, setting their sights on winning world (which primarily meant U.S.) markets. Their successes are well known.

And yet, at April's American Chemical Society Middle Atlantic Regional Meeting, a Japanese scientist from Columbia University said the U.S. had only the brightest of prospects, with nothing to fear from Japan. His native country, he said, even envied the U.S. The reason for the envy, he went on, was the continuing dynamism within the American research and development fabric, marked especially by the continuous cross-fertilization of cultures and ideas. Japan had nothing like that, he said, and for that reason America would always be first.

Milbergs: R&D system in a revolution

Lundine: no organized dialogue

The symposium then drifted back into the usual discussions of research and development stimuli, capital formation, and the contradictory policies in Washington. One participant did whisper over the lunch table, "He's right," but nothing more was said.

To assert that the U.S. has no technology policy is, of course, merely the usual play of political cynicism. The government has no technology policy because few people if any know what the term means. If there is a policy, this Administration says it already is in place under the provisions of the Economic Recovery Act Reagan pushed so hard to pass last year. That act accelerated depreciation allowable on new equipment and gave generous tax credits to companies investing in research and development. Other legislation permitted universities to grant exclusive licenses to individual companies on results from government-funded academic research.

But there was a lot the Reagan Administration did not do. For one thing, it refused to implement in any significant way the Stevenson-Wydler technological innovation act passed during the dying days of the Carter Administration. For another, it wouldn't go along with support of the Small Business Innovation Act, which provides set-asides to small businesses of 3% of every agency's R&D budget. The Senate unanimously passed the bill earlier this year. But the House could well reject it. Reagan almost certainly will veto it. Finally, the Administration decimated applied research and science education programs.

But significantly, Reagan did consent to establish in the Commerce Department an Office of Productivity, Technology & Innovation, retaining the very name Carter chose for that same office. Moreover, the Administration said technology and innovation would be given a high order of priority in Commerce, establishing an assistant secretary slot for the subject. Bruce Merrifield, a corporate vice president at Continental Group, was selected for the job and his name went to the Senate for confirmation two weeks ago.

In the meantime, OPTI, which will be under Merrifield, is being headed by former SRI International staffer Egils Milbergs. Commerce will be trying to integrate technology with general economic policy, something never done seriously before.

Milbergs takes an upbeat but modest view of the work of his office. "We see the Commerce Department simply as an honest broker," he says. "We don't want to make government too much a partner with business. The research and development system in this country is going through a revolution. We don't believe any new funding is needed. The problem is how to tie people together."

OPTI's mandate, although soft, appears at least broad. On a budget of $1.8 million and a staff of 32, its job is to:

- Staff the activities of the National Productivity Council.

• Study the effect of federal policies, programs, legislation, and regulation on productivity growth, technological development, and innovation in the private sector.

• Be the coordinating focus for all Commerce Department activities in those fields.

• Run a Commerce Department clearinghouse for collection and dissemination of information to the private sector on productivity.

• Run workshops, seminars, and related happenings for business on innovation.

• Carry out the federal coordinating role called for by the Stevenson-Wydler Technology Innovation Act of 1980.

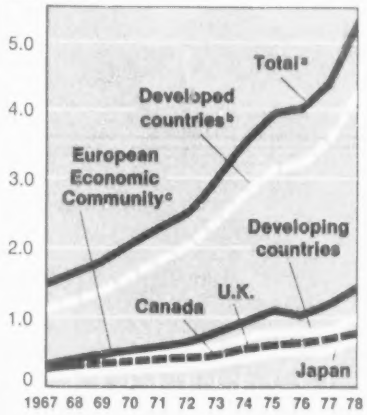
Critics of the Administration would call that last job a joke because the Administration has been doing all it can to rub out the act. One of its features called for establishment of several federally funded centers for industrial technology for development of various "generic" technologies that large sectors of industry use but no industry by itself concentrates on.

The Reagan Administration likes the idea of generic technology but says if industry considers such centers important, industry can pay for them itself. It made its opinion official by putting it in the *Federal Register*. OPTI, however, would give some staff assistance to any university or company interested in forming such a center.

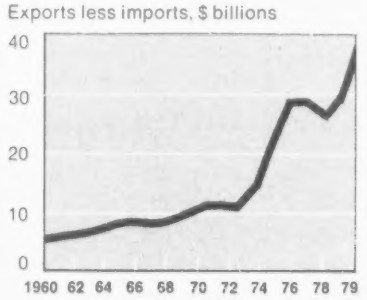
Milbergs thinks the government can do a lot simply by being a good information broker between government and industry. One policy innovation he says the department is working on is a redefinition of productivity. The traditional definition is, of course, output per manhour. But that definition is passé in a more complex world. "Ideally," he says, "we should relate output to a combination of inputs—labor, capital, energy, materials, and technology—and analyze the relative importance of each to productivity. Currently, there are no official government measures of multifactor productivity, although the Bureau of Labor Statistics has a major program for developing such measures for the U.S. economy. Also, productivity measures do not always account for the quality of inputs or outputs. These are key factors in increasing competitiveness."

Milbergs says the Commerce Department's Bureau of Industrial Economics is doing a study to develop measures of productivity for about 90 individual industries using the total factor concept. Another project will examine the effects of the shortage of scientific and engineering manpower needed by industry for improving worker output.

U.S. royalties from foreign countries still growing...



...as is U.S. trade balance in high-technology goods



a Represents net receipts of payments by U.S. firms from both their foreign affiliates and unaffiliated organizations for the use of intangible property such as patents, techniques, processes, formulas, designs, trademarks, copyrights, franchises, manufacturing rights, and management. Excludes film rentals. b Includes Western Europe, Canada, Japan, Australia, New Zealand, and the Republic of South Africa. c Original six members only. **Note:** Data for 1978 are preliminary.
Source: "Science Indicators—1980," National Science Foundation

The department, he says, already has sent information to companies on the effect of improved management concepts to productivity improvements. These include employee incentive programs, quality control circles, labor-management committees, office automation, new process technologies such as robotics and computer-aided manufacturing, and productivity measurement.

"All too often," he says, "top U.S. managers have stressed quick returns rather than the development of future markets. Management energies have been absorbed with sustaining stock prices to defend against acquisition, rather than focusing on production, quality improvements, and productivity. Management of the next decade is the management of change. The role of management is one of continuous technology updating, human resource development, and strategic planning."

Two approaches the department is taking bear some watching. One is establishment of an office of competitive assessment—temporarily headed by Theodore Schlie—which will make long-term assessments of the competitive outlook for a wide range of American technologies. The second activity is an office of strategic resources under Robert D. Wilson. This office will serve as an information center on key raw materials needed for the functioning of an advanced industrial economy with its endless appetite for exotic metals and alloys.

Keyworth's Office of Science & Technology Policy, while waiting for Merrifield's confirmation to determine its policy role, is not quite standing still. Assistant director of OSTP's life sciences and institutional relations unit Denis J. Prager says the office is tracking the activities of the Business-Higher Education Forum pulled together by the American Council on Education. One of the aims of the forum is to look for ways of improving innovation and productivity in business by better drawing on the know-how of university faculties. The forum is composed of 50 chief executive officers from industry and 50 university presidents. Their goal is to present OSTP with an action plan for no-cost Administration initiatives.

"The other thing," says Prager, "is that we have asked the Industrial Research Institute to provide us with a fellowship that would allow one expert in industrial innovation to work with us. We're a small office, most of us don't know much about innovation, so we could use someone who could work with us for a year." Prager says IRI has agreed to do that and is in the process of picking a fellow.

"What we're seeing," he says, "is a big attempt to bring a better balance among all the players. We may have a science policy, but what we don't have is a technology policy. If we do, it falls apart very quickly when we look at the international marketplace."

In an economy that everyone

Tribus: management measured badly

agrees currently is threatening to fall apart, this Administration isn't free of its critics. The Administration's policy has been to cut corporate taxes so much that new investment capital would be available to industry to modernize and innovate. But will the Reagan tax reform steps actually improve innovation? Studies in the past have shown that industry spends money to invest in new plant and equipment regardless of government incentives to do so. Indeed, the steep rise in industrial R&D spending over the past five years well preceded the previous Administration's initiatives on innovation policy. Thus, there is considerable room for skepticism over whether current government economic policies are relevant at all to producing an innovation climate in the U.S.

There may be, in fact, a built-in reward for the noninnovating company in the Reagan economic scheme. A money-losing company, under current tax law, can sell its unused tax credits to profitable companies and thus be rewarded for not being successful. In fact, the second company, already fat, is rewarded incentives that could lead it to practice complacency.

Furthermore, the Administration still has a policy of protecting companies that are only minimally competitive, such as steel. Protection offers no incentive to do better. For example, protecting the outmoded technology of big steel plants works to the detriment of the smaller, more productive electrical steel plants usually seen in the South.

"If nothing can be done about removing trade restrictions and discovering a better set of policies to promote competition," says economist Burton H. Klein of California Institute of Technology, "it is likely that we will find ourselves in a worse and worse economic predicament. There are many economists who believe that inflation can be kept under control by keeping unemployment at something like 8 or 10%. I do not believe that. Britain has experienced very large price increases in the face of seriously deteriorating economic conditions. And I think that under present policies we are headed for the same catastrophe."

Criticism of Reagan's economic policies comes from all directions, of course, but the "technology policy community" has its complainers, too. One of the more vocal is Rep. Stanley N. Lundine (D.-N.Y.), a member of the House Banking and Science & Technology committees and chairman of the House Task Force on Technological Innovation.

Lundine says that although the Administration's R&D tax credits were a positive idea, "Reagan refuses to conduct an organized dialogue among business, the laboratory, and academia. It refuses to support R&D spending at any reasonable level, and refuses federal support for education."

Lundine believes the Administration could do a lot more to make U.S. high technology more accessible to foreign markets. "We should take some initiative with respect to industrial policy and encourage a dialogue among business and government, labor, and others. This wouldn't be so much like Japan picking winners and losers but instead determining what the particular blockages are to innovation and utilization of new technology. I think Congress should take a serious view of the interface between technology and workers and use it. The human element of innovation has been overlooked. This is where the Japanese have concentrated more than capital investment."

Lundine is backing passage in the House of the highly controversial Small Business Innovation Act, which slipped unanimously through the Senate earlier this year. He is also backing "some kind of national reciprocity legislation that would ensure that U.S. companies be given the chance by foreign countries to sell goods in equivalent amount that they sell to us."

In addition, Lundine is critical of the university business and management schools for ignoring for so many years the understanding of technology and manufacturing in the training of executives. "The only thing we can do in Congress along this line is to expose the problem. The business schools are really way behind the times. For example, at Harvard they are only now requiring a course on organizational development."

Deming: manager works within system

In June, the House Banking Subcommittee on Economic Stabilization, of which Lundine is a member, will be holding hearings on industrial policy. He says he will try to get witnesses to talk about the need to consider the importance of understanding manufacturing and technology on the part of managers. He says he will be looking for labor witnesses with orientation toward getting management and labor to work better together.

The labor forces in the mature industries like auto and steel manufacturing are in tough shape, but Lundine says there are no worker retraining bills on the docket. He thinks, though, that such a thrust is needed as part of a reindustrialization policy. "The other day I heard a bright union guy say Detroit needed as many auto jobs as were being lost because the workers couldn't be expected to learn the new technologies. But I think there are lots of things an intelligent machinist can do. We ought to be thinking about how the government and industry can help these workers get retrained."

One academic who is putting a lot

of energy into policy innovation is Myron Tribus, director of MIT's Center for Advanced Engineering Study. Tribus is a former assistant secretary of Commerce for science and technology. He doesn't think any Administration in Washington will solve the problem of technology policy until it really comes to grips with the productivity problem. And that means getting familiar with what it means to be a good manager in a competitive economy.

"The government is beginning to focus on the problem of productivity," he says, "but not on the solution. If you look at American management, you find that these are bright people. You find that they're aggressive, they're energetic, they work hard, they're dedicated. But just like their workers, they're embedded in a system. They and the people around them don't really understand what their jobs are. And they are measured badly and falsely.

"A former student of mine who started with $15,000 now runs a $100 million business. One time we were talking about managers and he said, 'You know, another guy could come in and take over my job and he could look real good by cutting off research and development.'

"In other words, by doing dumb things in our system, a person can look real good. He accepted that. He didn't question the system, or understand why anybody who was destroying the company could look good. How is that? The reason it is that way is because the image that people have of what it means to be a good manager is inappropriate."

Tribus uses such anecdotes to introduce his listeners to the work of productivity expert W. Edwards Deming, now 81 years old and living in Washington, D.C. Deming is widely regarded as the one responsible for the emergence of Japan as the most innovative industrial power in the world. Brought to Japan by Gen. Douglas MacArthur after the war to help restore its ravaged industrial base, Deming set about educating Japanese industrialists about the kind of management that propelled the U.S. into world industrial leadership in the early years of the century, namely, involvement of management and labor in a unified, nonhierarchical system of production, requiring worker participation in the gathering of data and statistics on the efficiency of the manufacturing process.

The result is what Caltech's Klein saw in a recent visit to an auto plant

Branscomb: more than one villain

in Japan—a system "having engineers close at hand who can design new machines and quickly make modifications in existing machines, having a special procedure to test new production equipment before it is committed to large-scale volume production, using 'quality circles' in such a way that they not only improve the quality and reduce the costs of this generation of cars but also supply inputs for the design of new equipment, employing a versatile labor force, designing robots so it is relatively easy to change the production lines, and so forth." For all that, the Japanese give Deming the credit, awarding yearly a Deming Prize to the company best reflecting his ideas.

"The genius of Deming's work," says Tribus, whose center is publishing Deming's latest book next month, "is he understands better than anyone else in the world that the job of a manager is to give consistency and continuity of purpose to an organization to guarantee that workers will have jobs in the future. Nobody else has that responsibility but the manager.

"Deming's second major insight is that people work in a system. That means the job of manager is to work within it, to improve its ability to produce the highest possible quality output at the lowest cost. That's the job of manager, and he [or she] should be measured on it." Tribus, with the zeal of a John the Baptist, says that over coming months he will be preaching the Deming message everywhere he can—to the banking community, to businesses, to Congress. He says the government especially needs educating because he notices on the Commerce Department's Productivity Council, neither Deming nor any disciple of his is a member. "Deming," says Tribus, "has known for a quarter century that unless Americans changed their approach to productivity and quality, the economy would be destroyed."

The council, though, does have Lewis M. Branscomb, chief scientist at IBM and former director of the National Bureau of Standards when Tribus was assistant Commerce secretary. Tribus and Branscomb were seen as a dynamic duo who tried to make the bureau's work more relevant to the environmental, consumer, and industrial needs of the late 1960s and early 1970s.

Currently, Branscomb heads the research and development committee on the Administration's productivity council and as chairman of the National Science Board has been spearheading changes in that body's influence on science policy in the U.S. Branscomb's speeches indicate no discovery of Deming as yet, but he does offer his own diagnosis of the innovation/productivity problem in the context of new federalism connections.

"No single villain can be pinned with the blame: government for overregulating, labor for being too impatient or too reluctant to accept change, banks for being too conservative, business schools for being too theoretical, engineering schools for demotivating students from careers in manufacturing, universities for failing to build graduate computer science capability fast enough, school boards for allowing a deterioration in math and science instruction. All these trends, taken together, spell trouble."

The healing process Branscomb does see appears to be old-fashioned working out of federalism at its best. What is already on view are the beginnings of new alliances among universities, states, and corporations blending their resources for the sake of regional economic development. He likes the view.

"I could easily imagine," he says, "a set of 50 state commissions on education, technology, and development, in which local members of engineering societies might find industry, community, and political leaders who are willing to find out what's going on in other states and see what they could do to help. I think it's more politically legitimate for a state to collaborate with industry in the quest to attract busi-

ness. And, in this, the states use their greatest asset—their universities—and thus compete with each other. That's a powerful force. State governments, once they get informed and interested, can be an important source of enhancement and encouragement, even investment."

It is a bit curious, however, that Branscomb in his vision of the new technological federalism omits the work of two contemporaries of his while he served in the federal government, one might even say mentors. The first is J. Herbert Hollomon, assistant secretary of Commerce for science and technology in 1962–67, who brought Branscomb in to head the Bureau of Standards. The other is Myron Tribus. Hollomon is currently director of the Center for Policy Alternatives at MIT and recently coauthored with Tribus a paper on new policies needed to improve American productivity derived from the ideas of Deming.

The 1960s were a time, of course, of lots of social and political ferment. Some new policy concepts also were being born at the time. One was the idea of the federal role in regional development. This was born out of President Kennedy's experience of the poverty in West Virginia during the 1960 Presidential campaign. By 1964, Congress had passed the Appalachian Regional Development Act designed to spark the economic revitalization of the 13 states in the Appalachian Mountains. The goal was to attract industry into what it regarded as an inaccessible cultural backwater. After the Appalachian Act came the Economic Development Act established in the Commerce Department. This legislation established various regional commissions around the country with the idea that the federal government would pump money into various job-building programs and projects.

Hollomon took these concepts into the realm of technology. He looked at the history of agricultural development in the U.S., with its network of land-grant schools and research and extension services around the country and asked why not a "technological extension service?" Under this idea, states would combine forces with industry and academia to combine the knowledge generated by researchers in the universities with economic and industrial plans within the states. Out of that concept came the State Technical Services Act, which supplied seed money to the states to set up their programs. Soon, governors began appointing "science advisers," state legislatures were doing the same, and an entire infrastructure began to grow. This skeleton remains today, and seems to be taking on some flesh. Ronald B. Frankum, the deputy director of OSTP, in fact, was a science adviser to Reagan when the President was governor of California.

One more unsung hero deserves mentioning. This one is M. Frank Hersman, who currently works in the general counsel's office at the National Science Foundation. State Technical Services was never too popular with Congress and after about three years was terminated. But the concept was rescued by Hersman, who at the time was running a small intergovernmental programs office at NSF. Hersman continued the labor of establishing science policy capabilities in state governments, usually against the conservative, research-oriented instincts of NSF. After he produced a report for President Ford on technology in the context of federalism, the foundation farmed Hersman out to the Colorado state government, where he helped consolidate science and technology policy structures in the Rocky Mountain region before returning to Washington.

So in a way, the U.S. may be coming back to old-time technological religion by the restoration of a sense of community in the workplace and among universities, corporations, and state and local governments. Little has come forth, however, from the chemical community on that theme. The American Chemical Society has worked hard to establish an interindustry system of support for research universities suffering under diminished federal R&D funding. But such a thrust, although important, skirts the larger issue of a national innovation policy. One ACS member who has been trying especially hard to bring the society to a consensus on innovation is James L. Hecht, research associate of the polymer products department at Du Pont. Hecht organized and chaired a blue-ribbon task force in the Delaware Section of ACS in 1980 to produce a policy statement last year. The statement the task force issued said the most important step the government could take would be to "change the tax laws so as to increase the availability of investment capital and its allocation for productive facilities" by accelerating depreciation allowances for new facilities for production and R&D, introducing tax incentives for new facilities for production and R&D, providing tax incentives to encourage savings and investment by individuals. Some of this the Reagan Administration already has done.

But Hecht says the government should do more to encourage more savings as a source of investment capital and actually produce a strategy that would support the growth of new innovative businesses. "We are still beneficiaries of things that help the rich, not the innovative," he says. Those savings should be going into productive facilities, he believes. "If we want to raise the amount going to investment by 4% of the gross national product, that means we have to invest $100 billion per year more than we do now in productive facilities. I think ACS has to come to grips with just what is holding up innovation. When we simply tell Congress to appropriate more for research, we are leading Congress away from the importance of capital investment. In my own view, I think we should tax consumption instead of earnings."

Said pollster Lou Harris last September to a meeting of the Yale University Political Union, "If, by this time next year, inflation is not below 10%, if the prime rate on borrowing is not down to 11 or 12%, if capital investment is not up sharply, if new technology is not being infused into the industrial process, and if the federal budget is not well on its way to being balanced, then the patience of the American people will be stretched to the breaking point. People will say to the management of business, 'Where have you guys been? For 30 years you've been screaming give us a chance. We give it to you and you come up empty.' "

The "cutting edge" issues of the 1980s, according to Harris, will be whether the government should set targets, monitor, and even participate in the capital formation process; whether it should help restore the scientific and technological capability of American industry; and how it can monitor and assist in setting targets and rates of progress toward turning around lagging productivity.

"Be assured of this," Harris said, "One way or another, the American people mean to make this system work." Now the question might be whether American management and technology can speak with the same American voice through what in its purest form once was called the government of the people. □

Chemical capacity use sinks to 60%

The recession has slashed U.S. chemical plant use across the board; output is down 18% with capacity virtually unchanged

William F. Fallwell, C&EN Washington; Bruce F. Greek, C&EN Houston

The slow retreat in U.S. chemical plant use rates from last summer has turned into a rout. The recessionary path the industry has been forced to take has become rougher than anyone imagined when the first inklings of a dip interrupted a supposed recovery about the middle of last year.

By the first quarter of 1982, overall use of nameplate plant capacity was beaten back to 60% in basic chemicals, 63% in plastics, and 67% in synthetic fibers, C&EN finds in its latest semiannual survey of the most important products. Last summer, the corresponding use rates were 72%, 76%, and 86% (C&EN, Oct. 12, 1981, page 12).

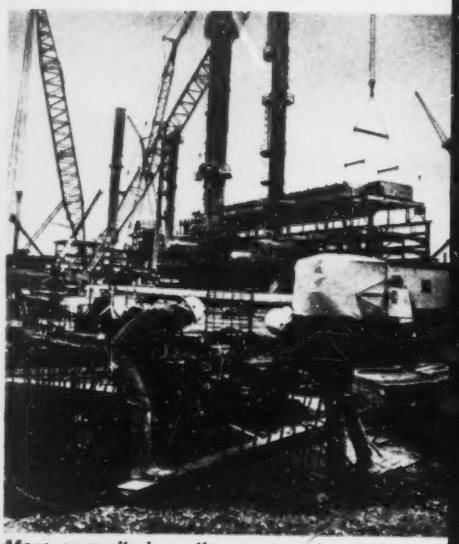
This means that the none-too-comfortable plant operating rates of 1981 have become painfully low, the lowest since C&EN began its capacity-use surveys six years ago. Until this year, use levels had never fallen below 70%. Now the industry is hobbling along 10 percentage points below the old floor level, and many products are doing even worse.

Behind the averages, a sharp drop in product volume has been the problem. For the 32 basic chemicals in the survey, production is down 18% from both the third and first quarters of 1981. For the five thermoplastics, output is off 15% from the third quarter and 18% from the first quarter. The group of six fibers is down the worst, 21% from the third quarter and 22% from the first.

Meanwhile, capacity itself scarcely has budged over the past 12 months. The industry's steady capacity expansion inherited from the 1970s finally has halted. In fact, there are signs of an eddy current of plant closings pulling down capacity totals for several products. Only a few products still have major expansion waves, and industry analysts are worried about the effects. More typically, potential expansion plans have been shelved quietly for a while.

The brutality of the current recession becomes clear in the across-the-board nature of plant-use cutbacks. Quite a few products escaped major damage in the 1980 recession. By contrast, not a single product now is operating over 80% of nameplate capacity.

Even effective capacity use looks



More capacity is on the way, such as this methanol plant Getty Oil plans to complete in late 1982 in Delaware City, Del.

Plant use falls hard in both plastics and synthetic fibers

Billions of lb per year	First-quarter 1982 Capacity (nameplate)	First-quarter 1982 Capacity use Nameplate	First-quarter 1982 Capacity use Effective	Third-quarter 1981 Capacity (nameplate)	Third-quarter 1981 Capacity use Nameplate	Third-quarter 1981 Capacity use Effective	First-quarter 1981 Capacity (nameplate)	First-quarter 1981 Capacity use Nameplate	First-quarter 1981 Capacity use Effective
Plastics									
Polyethylene, low-density	9.7	71%	76%	9.0	84%	89%	8.9	93%	99%
Polyvinyl chloride	8.0	62	72	8.1	75	87	7.8	77	89
Polyethylene, high-density	6.0	66	69	6.0	83	87	6.0	80	84
Polypropylene	5.3	64	71	5.3	77	86	5.1	82	91
Polystyrene[a]	5.4	53	62	5.7	70	71	5.7	68	80
AVERAGE		**63%**	**70%**		**76%**	**84%**		**80%**	**89%**
Synthetic fibers									
Filament yarn									
Polyester	1.9	70	74	1.8	93	99	1.9	82	87
Nylon	1.9	63	67	1.9	84	89	2.0	88	94
Olefin	0.99	64	68	0.94	69	73	0.90	69	73
Staple									
Polyester	2.8	77	82	2.7	97	103	2.8	93	99
Nylon	1.0	56	60	0.97	94	100	0.99	86	91
Acrylic	0.84	71	76	0.83	79	84	0.83	93	99
AVERAGE		**67%**	**71%**		**86%**	**91%**		**85%**	**90%**
OVERALL AVERAGE		**65%**	**71%**		**81%**	**88%**		**83%**	**90%**

a Between 5 and 10% of this capacity is shut down. **Sources:** Industry sources, Society of the Plastics Industry, Textile Economics Bureau, C&EN estimates

pretty feeble at the moment—65% in basic chemicals, 70% in plastics, and 71% in fibers. These are plant-use rates as a percentage of practical maximum output, which is almost always less than official nameplate figures. With the help of industry experts, C&EN gives each product a practical use coefficient, generally 85 to 95% of the official figures.

To be completely realistic, use rates would have to be split further for the two-tier plant structure that has shown up in several products—those pulled out of action for the rest of the recession, and those still running at rates higher than the official average.

The most notorious and far-reaching example is ethylene. Right now, industry analysts say from 20 to 25% of total capacity is shut down—up to 10 billion lb per year, with 1.3 billion lb out for good. This is more than the total individual capacity for half the products on the basic chemical list. The ethylene plants still open are running at about 75% of nameplate capacity.

The ethylene situation, like similar instances in other product groups, has had curious effects on closely related chemicals such as the coproducts from steam-cracking olefins plants. For example, propylene is in far stronger shape than ethylene, since its output has been held way down by the ethylene cutbacks and by feedstock substitution. The result is that the traditional price relationship between the two products has reversed. Instead of propylene's costing 2 to 3 cents a lb less than ethylene, ethylene now sells for roughly 5 cents less than propylene. Propylene's price has been dented slightly in recent months, but nothing like the wreckage in ethylene, which is discounted about 40% from the list price a year ago.

A more long-standing case is the chlorine-caustic soda relationship. Both of these electrolytic cell coproducts are running at historically low rates—62% for chlorine and 59% for caustic in the first quarter. (The normal use rate for these chemicals was 90% or higher until the past few years.) Chlorine's fortunes have sunk so low that some operators consider that it contributes little or nothing to cover plant operating costs. By contrast, caustic has been possibly the industry's most shortage-plagued product of the past few years. Although the worst pinch is past, and caustic's price appears to have peaked for now, its value has shot up tenfold since the 1960s.

The upshot for the chlor-alkalies is a long-expected plant shakeout. It appears to have started, and the new survey shows a slight drop in chlorine capacity. The chlorine figure probably will decline further later this year. Caustic capacity is still rising because operators have installed more evaporators to recover extra product. But caustic capacity will not be able to rise much more.

A third product pair with capacity shutdowns is phenol and acetone. Although the survey doesn't show a permanent capacity loss yet, industry analysts believe that from 5 to 10% of capacity isn't running.

Permanent capacity declines have hit several other chemicals. For example, in *p*-xylene, closings at Hercor and Shell Oil have pulled capacity down to 4.9 billion lb per year from the former 5.6 billion lb. In ammonia, the survey now subtracts 3.2 million tons per year of capacity considered generally shut down over the past few years. The ammonia total is 20.8 million tons.

In other products, sulfur's capacity,

C&EN's capacity-use indicator—the ground rules

Capacity use at chemical plants is difficult to measure and requires certain assumptions. These bring some order to the maze of variables affecting this critical indicator of the industry's health.

With the help of industry and government sources, C&EN measures capacity use as a percentage of both nameplate and effective maximums. Nameplate capacity is the official design capacity of plants. Effective capacity is the practical maximum after reductions for unplanned maintenance, corrosion problems, changes in product mix, and other influences. Although engineering companies and industry statistics groups try to make nameplate capacity data as "real" as possible, practical problems almost always reduce effective maximums to 85 to 95% of the official totals. For short periods, plants can run more than 100% of effective top capacity, but such a rate won't last more than a few months.

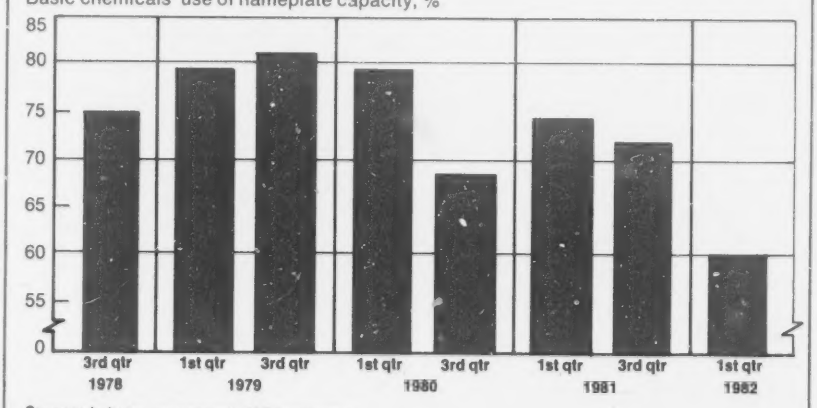
Capacity use is given over as much of a calendar quarter as production data permit, with no seasonal adjustment. The figures are for plants actually running. At present, some products such as ethylene, phenol, polystyrene, and urea have plants temporarily shut down because of weak markets. These plants still are included in capacity totals. The totals exclude new plants just starting up and old plants out of operation for long periods because of accidents. As much as possible, capacity figures stay current with expansions.

Capacity data don't take into account other temporary fluctuations for fuel and electric power interruptions, equipment failure, and feedstock scarcity or substitution. The feedstock variables have been important in the past few years in ethylene production, further reducing maximum output for several coproducts such as propylene, butadiene, and benzene.

Products in C&EN's capacity-use survey are the same as those in the Key Chemicals and Key Polymers series. These are the core products of the industry, the building blocks leading to downstream production of thousands of more specialized products.

Capacity use has been falling for a year

Basic chemicals' use of nameplate capacity, %



Sources: Industry, government, C&EN estimates

Effective plant use in basic chemicals drops to 65%

Billions of lb per year unless otherwise noted[a]	First-quarter 1982			Third-quarter 1981			First-quarter 1981		
	Capacity (nameplate)	Capacity use		Capacity (nameplate)	Capacity use		Capacity (nameplate)	Capacity use	
		Nameplate	Effective		Nameplate	Effective		Nameplate	Effective
Petrochemicals—olefins and aromatics[b]									
Ethylene	39.7	56%	62%	41.0	65%	72%	40.0	68%	76%
Propylene (chemical and polymer)	23.5	43	47	23.5	59	66	23.5	58	64
Butadiene	4.6	42	47	4.6	67	74	4.6	61	68
Benzene (bg)	2.7	39	43	2.7	67	74	2.5	68	76
***p*-Xylene**	4.9	61	64	5.6	64	67	5.6	75	79
Petrochemicals—C_1 derivatives									
Ammonia (mt)	20.8	80	84	24.0[d]	80	84	24.0[d]	83	88
Urea (mt)[d]	8.1	63	70	8.0	90	100	8.0	88	98
Methanol (bg)	1.5	72	80	1.4	83	92	1.4	90	100
Formaldehyde (37% solution)	8.9	51	54	8.9	65	68	8.9	66	69
Chlor-alkalies									
Chlorine (mt)	14.7	62	65	14.8	78	82	14.7	73	77
Caustic soda (mt)	15.6	59	62	15.5	75	79	15.6	73	77
Soda ash (mt)	10.4	76	80	10.0	83	87	10.0	82	86
Acids									
Sulfuric (mt)	59.4	54	57	58.5	74	78	58.3	74	78
Phosphoric (P_2O_5, mt)[e]	12.4	62	65	11.5	91	96	11.7	94	99
Industrial gases									
Oxygen, **Nitrogen** (total, liquid, ttd)	37.6	64	80	36.0	66	83	34.8	63	80
Carbon dioxide (ttd)	17.7	63	70	16.4	71	80	15.6	69	78
Mineral-based inorganics									
Sulfur (total, mlt)	15.7	61	—	16.0	68	—	15.4	76	—
Potash (mt)	2.9	78	—	2.9	76	—	2.9	86	—
Phosphorus (mt)	0.55	66	69	0.55	78	82	0.55	78	82
Plastics monomers									
Styrene	8.7	79	93	8.9	74	87	8.9	82	96
Vinyl chloride	9.6	50	56	9.7	70	77	9.2	65	73
Toluene diisocyanate	0.73	74	82	0.73	81	90	0.73	87	96
Fiber monomers									
DMT-PTA[f]	7.3	58	68	7.3	71	83	7.3	71	83
Ethylene oxide	6.8	68	76	6.8	72	80	6.8	65	73
Cyclohexane	3.1	33	35	3.4	59	62	3.4	62	65
Adhesives and coatings monomers									
Phenol[g]	4.0	56	62	4.0	67	74	3.6	69	77
Vinyl acetate	2.4	72	73	2.4	79	83	2.5	78	82
Pigments									
Carbon black	3.4	75	83	3.4	82	91	3.7	76	84
Titanium dioxide (mt)	1.0	53	62	1.0	82	96	1.0	77	91
Solvents									
Acetone[g]	3.6	59	66	3.6	58	65	3.5	58	65
Ethanol (mg)	270	50	53	270	56	59	270	65	69
Methylene chloride	0.83	54	60	0.83	64	71	0.83	75	83
AVERAGE		**60%**	**65%**		**72%**	**79%**		**74%**	**81%**

a bg = billions of gal, mt = millions of tons, tt = thousands of tons, ttd = thousands of tons per day, mlt = millions of long tons, mg = millions of gal. b About 25% of ethylene and lesser amounts of other capacity currently is shut down because of weak markets. c Total extraction capacity, which runs about 25% more than basic production capacity. d Some capacity, probably less than 15%, shut down. e Includes both wet-process and furnace-process capacity. f Dimethyl terephthalate and purified terephthalic acid, not including acid converted to DMT. g Up to 10% of capacity currently shut down. **Sources:** Industry and government sources, C&EN estimates

at 15.7 million long tons per year, is rated less in 1981 because of depletion at mines, which is running ahead of new sulfur recovery capacity at refineries and smelters. Two plastics monomers, styrene and vinyl chloride, also are rated less than in 1981 because of small shutdowns. And cyclohexane capacity has fallen 9% to 3.1 billion lb per year with Commonwealth Oil Refining's closing in Puerto Rico.

Basic chemicals with capacity going in the opposite direction are few—most notably soda ash, methanol, and the industrial gases, all of which have substantial investment campaigns with more on the drawing board. The big acids, sulfuric and phosphoric, also have added to capacity in the new survey, but analysts in this area think the bloom may be gone with the newfound troubles in fertilizer markets. Some capacity in both products is thought to be shut down. Similarly, urea shows a small capacity increase.

The scarcity of big new capacity likely will complement low utilization of existing capacity throughout this year. □

Polypropylene brightens outlook for olefins

As jokes go, it wasn't really all that funny: The British fleet actually was going down to Argentina not to recover the Falklands but to sink the barge-mounted polyethylene plant in Bahia Blanca. But for a gloomy group of researchers assessing the current overcapacity situation in polyethylene, at a Chemical Marketing Research Association session on olefins and other plastics, it drew appreciative—albeit rueful—laughter.

Indeed, several of the titles of the talks were illustrative of the depressed conditions in the plastics industry—"Shakeout in polyethylene," for example, and "Rationalization of PVC." Coupled with the news that even the heretofore highly profitable field of engineering plastics is on the brink of being overwhelmed by new suppliers and capacity, that left only the report that business is picking up for polypropylene.

With a slight cutback in polypropylene capacity—down to 5.25 billion lb per year this year from 5.5 billion lb in 1980—capacity utilization is picking up to 78% this year from the bleak 67% in 1980. And there is enough demand ahead to boost that to 94% by 1985, reported James J. Driscoll, marketing and sales manager of polypropylene at USS Chemical Co., the chemicals subsidiary of U.S. Steel. By then, he adds, capacity will have expanded again to an expected 5.43 billion lb per year.

Most promising areas for polypropylene, he says, would be in such specialized areas as resins for packaging films, random copolymers, and controlled-rheology fibers and plastics. Those kinds of applications will help fuel growth of just above 6% per year through 1990, he predicts.

However, those encouraging words about polypropylene were among the few heard at the session. And even the CMRA sessions themselves were hard-hit by the economic hard times, with only about half the normal attendance of 500 showing up for the annual New York City spring meeting.

According to Frederick A. Hajduk, director of company development at Chemplex Co., Rolling Meadows, Ill., there will be solid growth, 8% per year, over the decade for high-density polyethylene, and somewhat slower 3%-per-year growth for low-density polyethylene. The industry will continue to be plagued, however, by the overcapacity that has held the average operating rate for the HDPE industry to 80% from 1973 to 1981, and that of LDPE at about 85%. The industry's jump to linear low-density, he adds, will further confuse the situation. "Within the next few years, all producers will have some capacity that can be changed rapidly to produce resins across the entire density range," Hajduk says.

Chemplex has developed three scenarios for polyethylene, he notes. One is built upon the company's own predictions of energy consumption and prices, as modified from forecasts by the Department of Energy, and forecasts of economic and inflationary conditions. Under this scene, HDPE will grow 7.7% per year through 1990 to 9.72 billion lb; LDPE will decline 5.7% per year, to only 3.5 billion lb; and LLDPE will grow 35.1% per year to 6 billion lb of demand by 1990.

A less optimistic scenario assumes that energy and feedstock costs will be 10% higher than those in the base forecast, holding HDPE to about 6%-per-year growth through 1990; hastening a decline of LDPE with sales falling an average of 12.7% per year; and spurring LLDPE even more, by an average annual growth of 36%. Correspondingly, if the costs of energy and feedstocks are 10% below those of Chemplex's base forecast, the company expects HDPE to grow an average annual rate of 9.3% through 1990; LDPE to decline only 2.2% per year; and LLDPE to grow at an average clip of 33.6% per year.

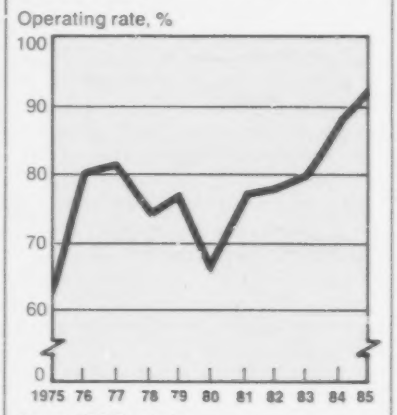
By the company's base-forecast predictions, the total polyethylene industry operating rate will be 110.5% by 1990. But as of 1985, it still will be only 84% of capacity.

Polyvinyl chloride faces a similar picture: slowing growth and relatively low capacity utilization rates. With an average annual growth rate of 12% in the 1960s, dropping to about 8% in the 1970s, PVC faces further maturation of its markets, leading to an average growth of less than 5% per year through this decade, reports Elliot A. Vogelfanger, manager of planning at Conoco Chemicals.

The industry is showing all the signs of a maturing industry—slowing of growth, high competitiveness with decreased bargaining positions for producers, need for a low-cost production position, and revenue constraints, Vogelfanger notes.

It also is an industry going through a massive change in technology. In 1970, small reactors made up 100% of PVC production. But by 1980, more than 60% were produced in large-scale reactors using latest technology, with more efficient yield. By one estimate, present PVC capacity is 7.5 billion lb per year, but even by 1984, demand will reach only about 7.4 billion lb.

Operating rates for polypropylene to improve



Source: USS Chemicals

Result? Producers will selectively shut down older, smaller equipment, Vogelfanger predicts, to help take the pressure off capacity—but also to make the competition for those companies remaining in the PVC business even more intense. And the prospects of an industry switch to even more efficient third-generation technology would intensify further the competitive picture, he adds.

In the meantime, the diverse world of engineering plastics will attract increasing numbers of competitors, to the point that returns on investment may be seriously affected, predicts Richard M. Kossoff, president of R. M. Kossoff & Co. consultants in New York City. Although the industry grew an average of 11% a year during the 1970s and into 1981, and will continue growing at nearly 10% per year through 1986, "Many segments of this business had unsatisfactory returns on investment, and it will get worse," he predicts.

The business is difficult to enter, he points out, because of patent protection for some polymers, the high capital investments involved, and what frequently runs 10 to 15 years to get a positive cash flow. Nonetheless, he predicts that the number of suppliers of engineering plastics will jump to 49 by 1992 from 32 in 1982, with Japanese suppliers accounting for 39 of those. Producers will tend to concentrate on just several basic polymer families, rather than try to offer broad product lines, and will concentrate on specialty grades, and on alloys with existing polymers. □

Sulfur market faces weaker year or two

After a decade of radical change in the 1970s, sulfur emerged in robust shape for the start of the 1980s. With twin strengths of a supply pinch and a booming market in phosphate fertilizer, sulfur enjoyed one price increase after another. It also enjoyed a forecast of supply tightness for years to come.

But events of late have disrupted the unanimity on its future. A fresh forecast at the Chemical Marketing Research Association meeting in New York City goes along with the optimism for the long run but warns that sulfur could be in for some weakness over the next year or two. Oddly enough, the problem could be oversupply, says Darrell G. Rangnow, sulfur specialist at Pace Co. Consultants & Engineers of Houston.

For 1983, Rangnow forecasts that exports of sulfur from Saudi Arabia, now entering the market, will reach 2 million metric tons. (For perspective, U.S. sulfur production currently runs about 10 million metric tons a year.) In the U.S., as much as 500,000 metric tons of new sulfur could come from recovery plants fed natural gas from the Overthrust producing area in the West. Sulfur from the Overthrust area depends on completion of a key gas pipeline project.

Meanwhile, a modest recovery in sulfur demand will occur as both the fertilizer market and overall industrial production improve. However, the demand recovery will not be large enough to offset the 2 million to 3 million metric tons of excess worldwide production. The surplus will go into inventories, which have been very low until just recently.

Accompanying the surplus will be geographic sales switches, Rangnow says. Exports of Canadian sulfur through Vancouver will decline as Saudi Arabian sulfur replaces it in places such as India, Tunisia, Morocco, and southern Europe. Competition from Overthrust sulfur in Canada, combined with Canadian exporters' need for cash, will push some Canadian sulfur down to the big Florida phosphates outlet. As Canadian sulfur moves into Florida, Rangnow believes that U.S. Frasch (mine) production will continue to decrease. At the same time, sulfur prices might weaken, marginal mines could be shut down, and U.S. exports could decline because of the competition from Canada and Saudi Arabia.

Longer term, however, Rangnow thinks that sulfur prices will firm through the end of the decade. Prices will be high enough to justify development of new sulfur sources.

So far in 1982, price weakness hasn't developed for contract sulfur on the Gulf Coast, according to Rangnow. He believes the reason is that Frasch sulfur producers have been able to reduce production selectively and increase inventories from their critically low level of the past few years.

Beyond this year, two major long-term changes will continue for sulfur demand, Rangnow says. One is that developing countries will require much more sulfur than before, increasing dramatically their share of sulfur consumption. Developing countries also will be a larger source of supply for sulfur during the 1980s.

Second, the already strong tie between sulfur and the world fertilizer market will get even stronger during the 1980s. This could mean continued erratic demand for sulfur because of the connection to agriculture, whose commodity products tend toward wild price movements.

On the supply side, gradual depletion of sulfur minable by the Frasch technique—using hot water to melt the sulfur underground and air to lift the sulfur to the surface—will be offset by increased output of sulfur recovered from sources such as natural gas, petroleum, and ores. Because of their increasing prominence, producers of recovered sulfur will take a more active role in marketing sulfur.

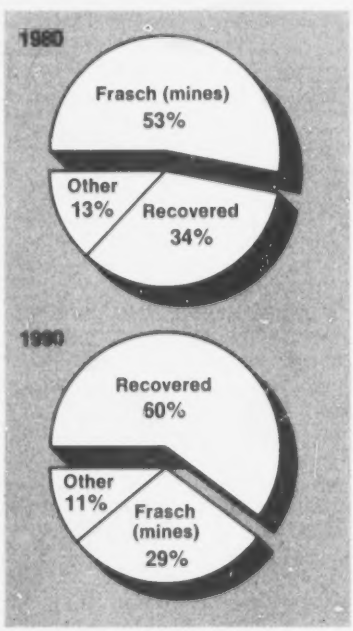
By 1990, demand for sulfur in the U.S. and Western Europe will account for about 42% of the total worldwide demand, down from nearly 49% in 1970. Demand in developing nations will surge to 27% of the total from 17% in 1970.

On the supply side, in 1990 the Canadian and Western European share of the total will be down to 23% from 31% in 1970. The U.S. share will increase a bit to 25%. Other producer categories—noncommunist countries, Asia, and the Middle East, will provide 21%, up from 14% in 1970.

In the U.S., supply of Frasch sulfur will sink to just 29% of the 1990 level, down from 74% in 1970. Recovered sulfur will take up all of the share lost by Frasch, growing to 60% in 1990 from 15% in 1970.

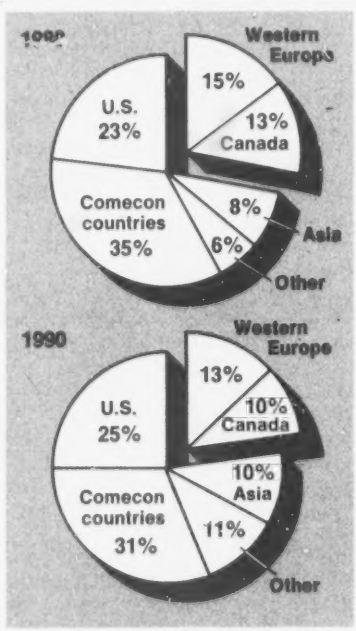
The U.S. use pattern for sulfur will continue its shift toward the fertilizer industry with 60% of sulfur going there in 1990, up from 39% in 1970. Use of sulfur to make industrial sulfuric acid will decline to 30% in 1990 from 46% of the total in 1970. □

U.S. sulfur sources will flip-flop in the 1980s



Source: Pace Co.

Sulfur supply from Europe and Canada will decline



Source: Pace Co.

U.S. chemical exports face sharp decline

Competition from world-scale plants now under construction in countries with low-cost energy will cut into export markets for U.S. chemicals

During a recent meeting of the Chemical Marketing Research Association in New York City, two U.S. chemical trade experts gave back-to-back forecasts of what world trade will be like for U.S. chemical companies during the remainder of the 1980s.

Each disclaimed that they were forecasting gloom and doom. But there was little in the analysis of either one that radiated optimism.

Myron T. Foveaux, legislative representative for international trade and economic policy at the Chemical Manufacturers Association, took a qualitative approach. Paul A. Cook, manager of chemical services at Data Resources Inc.'s Houston office, went the quantitative route. Both, however, reached the same conclusion: The eighties will be less than rosy for U.S. chemical exports.

"[Chemical] export markets will be lost as new plants come on stream in Canada, Mexico, and [Organization of Petroleum Exporting Countries]," says Foveaux. "By the late 1980s, today's rather large exports of some products will be replaced by net imports and a much lower level of exports for others."

Cook echoes these sentiments. During the latter half of the seventies, the spectacular increase in net chemical trade sustained, in large part, the strong growth in U.S. chemical production. One primary reason for the export surge, Cook says, was the significant raw material cost advantage that U.S. petrochemical producers had over their foreign counterparts.

But now that U.S. energy prices essentially have reached world levels, much of that cost advantage has been lost. "It is unlikely that the present high level of [chemical] exports can be sustained," says Cook.

Like Foveaux, he sees competition from the world-scale plants now being built in countries with low-cost energy eroding U.S. chemical export opportunities. And, like Foveaux, he expects that some U.S. companies will feel the impact of increased imports in some product areas.

Data Resources, which regularly keeps tabs on about 100 chemicals ranging from basic building blocks to final products, forecasts a decline in U.S. chemical exports on a volume basis through the rest of the decade. The reversal, in fact, became noticeable last year, in part because of the strength of the U.S. dollar.

Exports of aromatics derivatives, in particular, Cook says, already have declined abruptly in 1980 and 1981. Exports of ethylene and propylene derivatives also have dropped—and will continue to drop. But, compared to aromatics, they will hold up fairly well until 1985. That's because these products are based on low-cost, natural gas-based feedstocks. After that, world-scale plants outside the U.S., based as they will be on even less expensive ethane and propane, will threaten U.S. exports of ethylene and propylene derivatives seriously.

Between 1980 and 1985, Cook expects U.S. net chemical trade to drop to 4.2 billion lb from 9.4 billion lb. That's a 5.2 billion lb swing, which represents an average annual decline of 15%.

Should this happen, it will have a serious impact on the U.S. chemical industry. Cook estimates that between 1975 and 1980, U.S. petrochemical production grew an average 7.3% per year. This was possible only because a chemical export growth of 26% per year substantially reinforced demand in the U.S., which increased only 5.3% annually. Between 1975 and 1980, Cook emphasizes, exports accounted for fully one third of the growth in petrochemical output. Exports are a major reason why the industry grew at twice the growth rate of the gross national product.

But if net petrochemical exports drop as Data Resources expects through 1985, the impact will be felt in U.S. petrochemical production. The company estimates that U.S. demand will grow 5.1% per year between 1980 and 1985. But the 15% average annual decline in net petrochemical exports will restrict the growth of petrochemical production to only 2.9% annually. Between 1980 and 1985, then, fully one third of growth in U.S. demand will be offset by the net trade decline. The industry multiple becomes only 1.5 times GNP growth.

In addition to lost chemical export

Exports will become less of a factor in U.S. chemical production . . .

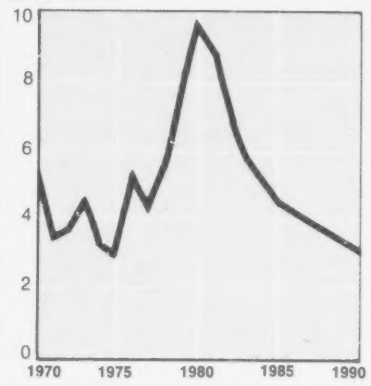
Product and derivatives	Per cent of demand					
	1980		1981		1990	
	Exports	Imports	Exports	Imports	Exports	Imports
Ethylene	16.4%	3.1%	15.2%	3.6%	7.5%	3.7%
Propylene	19.5	4.9	19.3	5.6	8.9	4.2
Butadiene	18.6	18.8	14.2	16.5	7.4	10.7
Benzene	21.4	6.0	20.4	10.4	9.4	8.0
p-Xylene	36.7	2.2	38.3	2.6	16.3	2.6

. . . and their decline will affect growth rate of petrochemicals output

Billions of lb	1975	1980	1985	% average annual growth, 1975–80	% average annual growth, 1980–85
Trade balance	2.9	9.4	4.2	26.0%	−15.0%
Domestic use	40.4	52.3	67.1	5.3	5.1
Production	43.3	61.7	71.3	7.3	2.9

Source: Data Resources Inc.

U.S. primary petrochemicals face decline in net trade



Source: Data Resources Inc.

markets and increased import pressure, Foveaux is particularly concerned about the impact that governmental action—both in the U.S. and abroad—will have on commodity chemical production. Energy policy, tax incentive, subsidization, and even production by governments in Europe, Canada, Mexico, and OPEC countries, are new forces to be reckoned with, he says.

With this in mind, Foveaux asks, what is U.S. government policy on petrochemicals? His answer: There isn't one.

Two studies assessing the competitive stance of the U.S. petrochemical industry are under way—one by the Department of Commerce, another by the International Trade Commission. These indicate a government interest in petrochemicals, says Foveaux, but beyond that, there are no initiatives to encourage a strong petrochemical industry. And to add insult to injury, both the Administration and Congress seriously are considering an oil import fee; such a fee would put the industry at a further disadvantage.

If the U.S. chemical industry's involvement in petrochemicals declines as predicted, Foveaux believes that companies will become more involved with specialty chemicals. The problem, of course, is that this field can become overcrowded if too many chemical companies try the same solution. □

Argentina still needs chemical imports

Thousands of metric tons	Production	Imports	Exports
Sulfuric acid	226	—	—
Benzene	120	—	40
Caustic soda	107	45	—
Ammonia	54	—	—
Styrene	50	6	—
Methanol	36	—	4
Polyvinyl chloride	33	20	—
Low-density polyethylene	32	33	—
Phthalic anhydride	15	—	2

Source: SP Latin America

Chemical needs shifting in South America

South America has been and will continue to be an important market for chemical exporters. But within the area, national markets are changing constantly. Product requirements also are shifting.

As a result, export hopefuls must keep their market analysis up to date if they expect to take advantage of the chemical export opportunities that exist in South America.

That's the message that William D. Gersumky brought to his audience at the recent Chemical Marketing & Research Association's review and forecast meeting in New York City. Gersumky, who is head of SP Latin America, Cornish, N.H., believes that the rewards are worth the effort. He estimates that South American countries imported about $5.5 billion worth of chemicals last year. Based on Department of Commerce figures, U.S. companies enjoy an estimated 40 to 45% of this business.

As Gersumky sees it, the potential for chemical exports to South America will continue to expand, even though some countries there are expanding and diversifying their own chemical industries and making them more sophisticated. However, as South American chemical import requirements increase, the content of the total import basket will be changing.

For instance, he says that companies that had been shipping polyolefins to Brazil, Argentina, and other South American countries may find that the gravy days are over. Companies that export plastics additives or fancy processing aids may find that their days are just beginning.

The good times may be over for exporters of monomers and other bulk petrochemicals. But the future is promising for exporters of fine chemicals, photographic and reprographic chemicals, specialty paper coatings, and many other specialty chemicals.

Gersumky says there are four types of chemical products that offer the best prospects for sales to South American markets:

- Products with no raw materials base at reasonable cost (such as soda ash).
- Sophisticated or specialty products for which local market size cannot justify the required plant investment.
- Workhorse products for which local capacity is not yet built up, or for which market growth has outpaced the rate of new plant investment.
- Proprietary formulations that have distinct advantages over locally produced products.

Gersumky concentrates his analysis of South American chemical markets on Brazil and Argentina. These two countries alone account for about 80%, or $4.4 billion, of all South American chemical imports. In addition, the two countries are supplying significant and growing volumes of chemicals to their South American neighbors, especially Bolivia, Paraguay, Chile, and Uruguay.

Argentina, of course, is a country in trouble. It has been in trouble since long before the Falklands crisis.

The greatest curse of the Argentine chemical industry has been the superprotectionism of past decades that allowed companies there to build and operate undersized and uneconomic plants. A 15,000 metric-ton-per-year polyethylene plant is only one example.

High-priced products from such plants, coupled with a rapid dismantling of Argentina's tariff walls, have convinced chemical buyers there that importing is the least expensive way to secure supplies.

Gersumky tabs heavy inorganics, such as soda ash and caustic soda, as

Brazil's plastics imports are being replaced by local production

Imports, millions of $ (U.S.)	1981	1980
Low-density polyethylene	$3.2	$35.2
High-density polyethylene	3.2	4.2
Polypropylene	1.3	1.9
Polyvinyl chloride	3.9	20.3
Polystyrene	1.2	2.1
Acrylonitrile-butadiene-styrene	1.0	1.5
Polyvinyl acetate	5.4	5.3
Polyvinyl acetate/polyvinyl chloride	3.5	3.6
Acrylate/methacrylate	3.5	7.1
Polyacetal	1.7	na

na = not available. Source: SP Latin America

the best bets for U.S. exporters to Argentina. "We have long since ceased to predict when Argentina's long-overdue . . . soda ash plant will actually come on stream," he says.

Argentina produced 32,000 metric tons of low-density polyethylene last year, but required an additional 30,000 tons of imports. Most of these imports came from Brazil, which also supplied more than half of Argentina's high-density polyethylene requirements.

Argentina imported an estimated $700 million worth of chemicals in 1981. And, says Gersumky, its import needs run the gamut from basic chemicals, plastics, and intermediates, through a long list of specialties.

Brazil is the largest single chemical market in South America. In 1981, it imported an estimated $3.7 billion worth of chemicals, plastics, and related materials.

However, says Gersumky, the Brazilian government is making it tough on outside chemical suppliers. It tries to entice you to produce locally, he says, by making it difficult and expensive for Brazilian companies to import. It also encourages them to use alternate local products, even if these products are inferior.

Meanwhile, Brazil has built a modern petrochemical industry, complete with downstream industries. It no longer imports the basics, intermediates, and plastics in large volumes as it once did. In fact, it now is a significant exporter to other Latin American countries of chemicals such as polyolefins, acrylonitrile, and ethylene glycol.

Last year, Brazil exported almost $700 million in chemicals and plastics. About half of this went to neighboring countries in South America.

The "export or die" idea has caught on in the Brazilian chemical industry. And, says Gersumky, it is no temporary phenomenon of getting rid of excess production.

Despite this, Brazil's chemical import requirements remain substantial. It imported $3.7 billion worth of chemicals and related products in 1980, more than half of which were organics and specialties.

Some of this demand could disappear when the Norquisa S.A. plant comes on stream at the Camacari petrochemicals complex. Norquisa has a mandate to build a $70 million, multipurpose aromatics conversion plant to produce some or all of the 40 or more intermediates that Brazil now imports. □

CHECKOFF

PLANTS

■ **Canada**—Celanese Canada has received industrial development permit from Alberta Provincial Cabinet to construct world-scale acetic acid and vinyl acetate manufacturing facilities at its Edmonton, Alta., site. Capacity for $508 million facility was not disclosed. New plants will get their primary methanol feedstock from firm's $261 million, 4.6 million lb-per-day plant nearing completion at site.

■ **East Germany**—VEB Chemiekombinat has completed chlor-alkali plant at Bitterfield, north of Leipzig. Plant contains 104 diaphragm cells from Diamond Shamrock with capacity to produce 309 tons per day of chlorine and about 470 tons per day of caustic soda. It marks first time that diaphragm cell has been licensed into German Democratic Republic.

■ **Indonesia**—Kellogg Overseas Corp. and Thyssen Rheinstahl Technik as joint venture have been awarded contract of more than $1 billion to supply aromatics plant for Perusahaan Pertambangan Minyak Dan Gas Bumi Negara (Pertamina). Facility, which will process 30,000 barrels per day of naphtha, will be located in Plaju, Palembang, South Sumatra. Complex will produce benzene, toluene, *p*-xylene, *o*-xylene, cyclohexane, and nominal amounts of other coproducts. It also will contain 500 million lb-per-year purified terephthalic acid unit.

■ **Luxembourg**—Du Pont will build $55 million world-scale Hytrel polyester elastomer plant to serve markets in Europe, Middle East, and Africa; completion is scheduled for 1984.

■ **Saudi Arabia**—Foster Wheeler subsidiaries have signed contracts for overall management, engineering, procurement, and construction of $900 million petrochemical complex at Al-Jubail. Project includes 1.1 billion lb-per-year ethane cracker and 400 million lb-per-year linear low-density polyethylene plant capable of producing both low- and high-density polyethylene. Contracts are with Arabian Petrochemical Co. Petrokemya, partnership between Saudi Basic Industries Corp. (SABIC) and Dow Chemical Saudi Arabia Ltd.

■ **Japan**—M&T Chemicals has signed joint venture agreement with Yoshitomi Pharmaceutical Industries Ltd., Osaka, to warehouse and distribute organotin chemicals in Japan and other Far East markets. Joint venture will be called M&T-Yoshitomi Chemicals Ltd.

■ **Spain**—PPG Industries and several investors of Barcelona have formed companies to make, supply, and service Spanish automotive market with high-technology coatings, mastics, and sound-deadening products. New firm, of which PPG will have 60% equity with its affiliated company in France, Peintures Corons S.A., will be called Peintures Pittsburgh Ibericas S.A., headquartered in Barcelona.

ACQUISITIONS

■ **Australia**—Plastics operations of General Electric Co. has purchased engineering thermoplastic assets of M. E. Hogg Australia Pty., Dandnong, Victoria. M. E. Hogg has been manufacturing licensee for Lexan, Noryl, and Valox engineering thermoplastic resins since 1972. It also provides mineral- and glass-filled resins to Australian and New Zealand markets.

■ **Mexico**—G. D. Searle has acquired Recordati de Mexico S.A., pharmaceutical company that produces gastrointestinal treatments, throat preparation, vitamins, anti-infectives, and other products. It had 1981 sales of $6 million.

■ **Netherlands**—National Starch & Chemical has completed purchase of 50% interest it did not own in Delft-National Chemie from Gelatine Delft. Delft-National Chemie has headquarters, laboratories, and manufacturing facilities in Zutphen, the Netherlands, and additional plants and laboratories at Delft, the Netherlands, and Speyer, West Germany. Delft-National is producer of adhesives and resins.